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*La loi des petits nombres: recherches sur le sens de l'écart probable dans les chances simples à la roulette, au trente-et-quarante, etc., en général dans les phénomènes dépendant de causes purement accidentelles, suivies d'une instruction pratique pour le joueur.* Par M. CHARLES HENRY. Paris, Laboratoire d'Energétique d'Ernest Solvay, 1908. pp. xiv, 71.

The author of this monograph has set himself the task of discovering a law of small numbers: "est il possible de prévoir, à la roulette, des séquences, si fragmentaires qu'elles soient, au moins de signes d'écarts, les arrivées des événements se conformant finalement d'ailleurs à la loi des grands nombres"? He begins by showing that the appeal to the law of probabilities is hopeless. "Le caractère abstrait des principes et le caractère limité des lois de probabilités impliquent, en même temps que la vanité de tout système qui se réclamerait de la mathématique, la ruine infaillible du joueur"; "le joueur . . . ne peut puiser dans le théorème de Bernoulli, que la certitude éminemment morale de sa ruine inévitable." And if ruin is mathematically inevitable, it is, so to say, rendered more inevitable still by the conditions of the game: the occurrence of the blank, the enormous capital of the bank, and the limit of the maximum stake.

So far, all is plain sailing: Bernoulli's theorem and the law of probabilities. The author now has recourse to principles of 'energetics.' He takes, first, the law of inertia, "en vertu de laquelle tout phénomène énergétique présente une période d'établissement avant son état de régime et une période de persistance après la cessation de l'impulsion." This law may be assumed to apply to the roulette wheel,—if, that is, we may also assume the recurrence of a like starting-point, "d'un état initial périodiquement le même." And the second assumption is justified as a special case of another law of energetics, the law of periodicity, "en vertu de laquelle un très grand nombre de phénomènes physiques et biologiques, après une évolution suivant des lois complexes, mais en principe calculables, se reproduisent au bout de temps plus ou moins longs et qui est la conséquence nécessaire des périodes astronomiques."

There follows the construction of the empirical formula, gained by a conjunction of energetics and psychophysics. Chance, the author declares, is always a subjective phenomenon; "un phénomène fortuit est toujours une sensation remarquable, ou un complexe de sensations remarquable, agréables ou non, exprimable par des nombres entiers qui, la psycho-physique nous l'apprend, représentent des accroissements relatifs d'énergie." We thus have the psychophysical formula to start with, and by simplification of terms and acceptance of relevant hypotheses from the sphere of energetics arrive at the empirical formula required. The reasoning in this chapter iv—"Vues théoriques"—is exceedingly condensed, and depends in large measure upon M. Henry's views of general psychophysics, published and unpublished. So far as he understands these views, the present writer finds himself in disagreement with M. Henry upon various points. A discussion would, however, carry us far beyond the limits of the monograph under consideration. It must suffice to say that the author, in his concluding chapters,— "Vérifications expérimentales" and "Importance de l'état initial,"—gives the results of the application of his formula, and is able to show, first, that he gets a good agreement between calculation and observation, and, secondly, that the neglect of the principles of energetics leads to flat disagreement. The work ends with mathematical appendices and with an "instruction pratique pour le joueur."

The author remarks in his preface: "je n'ai pas l'outrecuidance

d'estimer que le joint énergétique et psycho-physique par lequel j'ai cherché à saisir le problème soit le seul possible et je ne me dissimule pas que des développements beaucoup plus étendus seraient nécessaires." The present writer must confess that he finds M. Henry's use of the psychophysical formula arbitrary, and even somewhat fanciful. At the same time, the author appears, in principle, to have solved the problem before him; the empirical formula, as has been said, works well so far as tested, and requires for its working the basis of energetics. Whether the theory can be bettered, and bettered in such a way as to accord still more closely with practice, must remain an open question. In the meanwhile, the author is to be congratulated on an ingenious and successful piece of work. J. E. HAYLEY.

*L'Etude Expérimentale de l'Intelligence et de la Volonté*, by J. LARGUIER DES BANCELIS. L'Année Psy. 13, 1906.

M. Des Bancelis calls attention to the new and promising field of systematic introspection, controlled, minute, severe, of which some of the first results are found in Binet's *Etude Expérimentale de l'Intelligence*, 1903, and some very interesting further results in H. J. Watt's *Experimentelle Beiträge zu einer Theorie des Denkens*, *Archiv f. d. ges. Psy.*, IV, 1905, and N. Ach's *Ueber die Willenstätigkeit u. d. Denken*, 1905. These experimenters found that the sensory type varies in the same individual according to the nature of the operations involved, that there is such a thing as a generic image, that a word can be understood before giving rise to any representation, and that a decisive and determining direction is given to the thought by the conditions of the experiment, although this condition or *donnée* shows its presence only by the determinations that it brings about. Thus thought, in proportion as it is direction, organizing force, evades internal observation, and Lachelier is right when he says that "of thought psychologists know only the light that it sheds upon sensation."

CEPHAS GUILLET.

*The Wisdom of the Wise; Three Lectures on Free-Trade and Imperialism*, by W. CUNNINGHAM. Cambridge, University Press, 1906. pp. 125.

"To try to take opponents at their best seems to be a sound maxim of controversy." Dr. Cunningham, a well known advocate of tariff reform and imperial co-operation, here selects three competent opponents, and discusses the views of Mr. Haldane on economic science, of Mr. Strachey on imperial sentiment, and of Lord Rosebery on the problem of the unemployed. The lectures have all the wonted charm and persuasiveness of the writer's style; their subject-matter is, however, beyond the scope of this *Journal*. An appendix deals with religion and political life, and with the imperialism of Cromwell.

P. E. WINTER.

*Laboratory Equipment for Psychological Experiments*, by CHARLES HUBBARD JUDD. Vol. III of a series of text-books designed to introduce the student to the methods and principles of scientific psychology. Charles Scribner's Sons, New York, 1907. pp. 257.

The description of the exercises which the author gave in volume II of his series was of set purpose dissociated from description of apparatus in view of the fact that the same laboratory exercises may be tried with a great variety of different kinds of material aids. The presence of this apparatus is better than written descriptions, but the author holds that apparatus is itself a valuable means of education and might well be described as a part of it: but the work is especially designed for graduate students who are preparing to teach or to make